

COおよびCHコンドライト中難揮発性包有物のBe-Bシステムティクス  
 Be-B systematics of refractory inclusions in CO and CH chondrites

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Observations of solar-type Young Stellar Objects (YSOs) have shown enhanced and frequent X-ray flares accompanied by intense flux of accelerated particles [1]. The powerful X-ray activity around newborn stars suggests that intense irradiation from the proto-Sun has also occurred in the early solar nebula. Be-B systematics of refractory inclusions, the first solids in our solar system [2, 3], can potentially shed light on irradiation processes in the early solar system.

Previous studies have demonstrated that a short-lived radionuclide  $^{10}\text{Be}$ , which decays to  $^{10}\text{B}$  with a half-life of 1.4Myr [4], was present in the early solar system with initial  $^{10}\text{Be}/^9\text{Be}$  ratios ranging from  $10^{-4}$  to  $10^{-2}$  [5-13]. However, most of the data come from refractory inclusions in CV3 chondrites. To further investigate the distribution of  $^{10}\text{Be}$  and irradiation conditions in the early solar system, we conducted Be-B isotopic measurements using a NanoSIMS 50 (at AORI, Univ. of Tokyo) on compact melilite-rich CAIs in primitive chondrites, Y81020 (C03.05) and SaU290 (CH3).

The melilite-rich CAI in Y81020 yields an isochron with the initial  $^{10}\text{Be}/^9\text{Be}$  ratio comparable to those of CV CAIs within uncertainties. The results suggest that CO CAIs have also experienced irradiation processes similar to CV CAIs. In contrast, a melilite-rich CAI in SaU290 shows no resolvable excesses in  $^{10}\text{B}$  from the terrestrial value. Previous studies have demonstrated that hibonite-rich inclusions in CMs and FUN inclusions in CVs typically show lower  $^{10}\text{Be}/^9\text{Be}$  ratios than those of most normal CAIs [7, 9, 12, 13]. In addition, these inclusions are known to have low  $^{26}\text{Al}$  abundances, which is interpreted as their formation prior to the injection of  $^{26}\text{Al}$  into the solar system [e.g., 14]. These observations may suggest that FUN-like inclusions record irradiation history in the protosolar molecular cloud [9, 15] and/or heterogeneous distribution of  $^{10}\text{Be}$  in the early solar system [12, 13]. A substantial fraction of CH CAIs also has little  $^{26}\text{Al}$  [16], suggesting possible relevance to FUN-like inclusions. The low  $^{10}\text{Be}/^9\text{Be}$  ratio of the CH CAI observed in this study could, therefore, support the above hypothesis.

#### References

- [1] Feigelson E. D. and Garmire G. P. (2002) *The Astrophysical Journal*, 572, 335-349. [2] Bouvier A. and Wadhwa M. (2010) *Nature Geoscience*, 3, 637-641. [3] Connelly J. N. et al. (2012) *Science*, 338, 651-655. [4] Korschinek A. et al. (2010) *Nuclear Instruments and Methods in Physics Research B*, 268, 187-191. [5] McKeegan K. D. et al. (2000) *Science*, 289, 1334-1337. [6] Sugiura N. et al. (2001) *Meteoritics & Planetary Science*, 36, 1397-1408. [7] MacPherson G. J. et al. (2002) *Geochimica et Cosmochimica Acta*, 67, 3165-3179. [8] Chaussidon M. et al. (2006) *Geochimica et Cosmochimica Acta*, 70, 224-245. [9] Wielandt D. et al. (2012) *The Astrophysical Journal Letters*, 748, L25 (7pp). [10] Gounelle M. et al (2013) *The Astrophysical Journal Letters*, 763, L33 (5pp). [11] Srinivasan G. and Chaussidon M. (2013) *Earth and Planetary Science Letters*, 374, 11-23. [12] Liu M. C. et al. (2009) *Geochimica et Cosmochimica Acta*, 73, 5051-5079. [13] Liu M. C. et al. (2010) *The Astrophysical Journal Letters*, 719, L99-L103. [14] Sahijpal S. and Goswami J. N. (1998) *The Astrophysical Journal*, 509, L137-L140. [15] Desch S. J. et al. (2004) *The Astrophysical Journal*, 602, 528-542. [16] Krot A. N. et al. (2008) *The Astrophysical Journal*, 672, 713-721.

キーワード：初期太陽系、宇宙線照射過程、Be-B同位体

Keywords: early solar system, irradiation processes, Be-B isotopes